19 Qualitative GIS: To Mediate, Not Dominate

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19.1 Our Realm of Discourse

As Michael Goodchild reminds us[1], the Seventeenth-Century geographer, Bernard Varenius, produced a treatise focused on two views of geography. One, clearly related to the work of Newton, covered general geography (dealing with a general set of principles) and the other dealt with ideographic geography (having to do with the special character of places). Varenius' (1650) two-fold approach affirms what our society has forgotten, but what is in agreement with Newton himself: we need to conceive of – there is – both a*bsolute* and *relative* space. The former is assumed by physicists in the course of their abstractions and the latter is experienced by ordinary people in the course of making their way in the world. However, today, the powerful realm of Geographic Information Systems (GIS), for all its potential for human understanding and good, does substantial violence by requiring that all our transactions and uses translate (radically convert) our experiential realms into the coded terms of GIS as based on data provided and available only in Euclidean geometrical terms for Newtonian space.

This chapter does not in the least disparage the power of absolute space, Euclidean geometry, nor general geography; but it does argue that we must reaffirm what Varenius and Newton also contended: the specific characteristics of different places and our everyday life experiences relative to ordinary objects must be accepted as complementary to the dominant conceptions. For GIS, this means that we need to develop a *Qualitative GIS* system that allows us to access successfully one another's lifeworlds rather than build enclaves through information technology.

The much heralded *Digital Divide* between those who have access to information technology and those who do not is even deeper in the case of GIS because the cultural capital of marginalized groups is itself denied or cast aside when the foreign conceptualizations of GIS are used to access the systems according to the required technological formats. In contrast, Qualitative GIS could operate in two ways, though which way depends on major practical and theoretical outcomes.

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[1] Welcoming remarks to the NCGIA Varenius Conference on Measuring and Representing Accessibility in the Information Age, Pacific Grove CA, November 1998.

Barbara Parmenter and I are conducting a series of projects to clarify logical and pragmatic alternatives. We begin with two assumptions: (1) GIS is structured on formal Euclidean geometry for spatial representation and on alpha-numeric database principles for informational content; and (2) current data bases represent Newtonian-Cartesian spatial conceptions and practices. What follows is our critical question: Given these two descriptively defining characteristics, is it the case, either theoretically and/or practically, *that GIS must operate on these Euclidean-Newtonian-Cartesian principles only*? If GIS is not so limited, then Qualitative GIS could be constructed on non-Newtonian, non-Cartesian, perhaps non-Euclidean databases – which can be found in or derived from the already existing, extensive ethnographic research literature and other existing data sources. On the other hand, if GIS is strictly contained within Euclidean-Newtonian principles of organization, then Qualitative GIS, strictly speaking, is impossible. The best that could be accomplished would be a translation of qualitative properties into Euclidean and alphanumeric representations. Even here, however, we have the possibility of two kinds of qualitative GIS. One such qualitative GIS would complement current GIS by inserting or encoding various kinds of hyper-media into standard GIS bases, actually superimposing qualitatively distinct information upon that standard base. The end result would be a kind of updated medieval, multi-perceptual mapping. Recall how medieval mappings regularly presented navigation information, along with glosses and drawings that surrounded or overwrote the basic cartography with story-telling, imaginative, theological, and other modes of information. A contemporary version of this would electronically insert personal, local, and imaginative narrations, images, and other perceptual-qualitative information over or through the standard GIS spatial layout. Alternately, it is possible to model mathematically various spatial configurations, for example, to represent qualitatively differentiated spatializations (raising the issue of whether such a format would be a mapping or a modeling, a question that does not need to be settled here). In either of the last two cases, though we would not have 'Qualitative' GIS strictly speaking, we nonetheless would have something close enough to it that, for non-specialized purposes, we would not have to apologize for and could drop the quotation marks, setting it off more rigorously according to its epistemological grounding.[2]

With either of these qualitative modes, the result would be a GIS that presents a set of alternative geographies and alternative ways of visualizing those spaces and

[2] I want to thank Professor Parmenter for her valuable contributions to this project. Not only did she keep me on the straight and narrow by providing normative control for correct use of concepts and technical terms, and provide helpful critique on the early drafts of this paper, but she continues to show a wonderful openness to theoretical and practical exploration of the topic. As I say to our students, we make a good team, since she knows what GIS actually is, while I, relatively unencumbered by facts, then can safely propose wild-eyed ideas. See at http://mather.ar.utexas.edu/students/cadlab/spicewood/ for more information on our current attempt at doing Qualitative GIS for a grass-roots, neighborhood natural and settlement environments project. If you have questions about the project, contact Barbara [parmentr@uts.cc.utexas.edu] or me [drbob@mail.utexas.edu]. I discuss the project briefly at the end of this paper.

places inhabited and experienced by diverse groups – in Varenius' terms, a new *geographis specificus*. This would enfranchise groups otherwise marginalized because it would allow them and the rest of us to begin to understand their worlds as articulated in their own terms and as embodying their own value systems. GIS then could manifest and affirm a multiplicity of worldviews and multiple geographies, rather than contribute to the reductive homogenization currently taking place. Our policy in regard to access would change: our professional and technical missions would be to help others say what they want to say in their own terms, so that GIS specialists could help others to delineate their own worlds. Together, we all could become conscious of our own lifeworlds, in their similarities and differences; consequently, we might learn to be more responsible toward all such lifeworlds, which in their intersections and tensions constitute the earth.

19.2 Problems

On whose behalf do GIS technical specialists gather and speak? It would seem presumptuous to say, since those who may be interested in more access to GIS would need to speak for themselves. But, they may not come forward unless invited, unless encouraged. So, we need to formulate an invitation, that is, to begin to create an opening in which they would be welcome and in which there would be a point to their coming. Of course, we are responding to the well-documented need that exists because of a gulf between those who have and use electronic telecommunication-information technology and those who do not.[3]

Researchers, practitioners, and policy makers recognize increasingly that the emerging division between 'haves' and 'have-nots' is no longer between geographically distinct first and third or fourth worlds divided according to degree of modernization-industrialization. Instead, it is between groups with and without access to the new information technologies and the power these bring. These new 'dual societies' often are found side by side, in the same cities and regions, in Washington, DC and Mexico City, in rural California and France (Castells, Mollenkkopf, and Robson 1998, Sanyal 1996).

Because highly developed information technologies, such as GIS, are both a product of and a means to develop our scientific and capital-intensive culture, we rightly assume that there are problems when these technologies are not as widespread as they might be. However, the motives and reasons of various constituencies using, not using, and promoting the spread of information technologies are varied.

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[3] The evidence is presented in all formats and for many audiences: in books by and for academics and researchers (*Investors Business Daily* 1998, Loader 1998, NTIA 1997, Schiller 1996). There is a rapidly growing literature on the subject. Feenberg and Hannay (1995) is theoretically noteworthy.

Some have faith in the progress of civilization through technology – a guiding idea born in the scientific achievements and theories of the Renaissance, developed in the 19th Century's Darwinianism and Hegelian-Marxist ideas of historical-cultural-material change, and matured in the 20th Century's hope in technology and expertise, exemplified in progressivism. Should not everyone benefit from technology, which is making the entire world better?

Others, emphasizing the post-enlightenment development of democracy and its spread across the planet, believe that universal education and access to information are essential foundations for informed decisions, that is, for self-determination. Thus, healthy social and economic decisions and interactions would be possible if all share the same, maximum information.

Still others, in the expansion and intensification of international capital, realize that the future of capitalism depends on developing and increasing new markets. Even with the high demand for the latest hard- and software from the core elite groups, the large 'middle-class' population's enthusiastic participation is essential for mass consumption. And, of course, the largest portion of potential consumers, those at the bottom of the economic and class scales in the United States and around the world, constitute the real potential market for high-technology, just as for consumable goods. Since this last group, by definition, does not constitute a consumer group because it does not have money with which to purchase, it can become a market only when the other more economically powerful groups purchase on its behalf, authorizing expenditures by governments, non-profit agencies and foundations, charitable organizations, and so on. Naturally, this third mechanism works by appeal to the first two: in the name of social-material-economic progress through technology or because of hopes for the spread of democracy, the capital system of development and purchase may be mobilized by those with power on behalf of those without. As should be clear, whether well intended or motivated only by self-interest, our desires and practices have many layers of cultural, historical, economic, and individual assumptions and values.

19.3 Epistemology and Ontology

Information, telecommunication, and geographical systems all operate within the same family of electronic technology. In terms of the theories of knowledge and operational procedures, they actually constitute branches of one system, the electronic processing of information symbols based on the assumptions of classical and contemporary physical sciences and mathematics. Without rehearsing that background here, several key sets of assumptions can be noted. To that end, here is my brief description of GIS:

> 'Upon' or 'within' a topographically correct electronic mapping of a spatial area, other digitized data sets can be 'inscribed' or 'inserted,' so that we can examine the correla-

tion of not only spatial elements, but economic, cultural, and any other kind of data we wish. Given the ability to see the way different dimensions of the world do or do not correlate, we can proceed with planning ways to change conditions to more closely realize the model we ultimately desire.

Among the assumptions, several concern the character of space. Though Newtonian physics has been supplanted by relativity, Newton's own theory of abstract and relative spaces remains pragmatically adequate to explain and operate within our earthly geo-political realms. Thus, we still use variations of Euclidean geometry and the concepts of absolute, abstract space in GIS because they are operationally correct and adequate. The definition of a 'good' map is one that corresponds correctly, point-by-point, with the features of the earth that objectively exist. This uses the Newtonian idea that in order for there to be a material world at all and for it to operate with law-like movements and forces, there first must be a containing envelope of space. This absolutely existing space (independent of and prior to the material bodies that come to occupy part of it) is not directly experienced, but abstractly understood through the mathematical sciences. Because this space is independent of material bodies, and a condition for their appearance, it itself is homogeneous--the same throughout. Differences within space are accounted for in terms of bodies and forces among bodies. Congruently, this homogeneous space is isotropic; that is, no 'direction' is inherently different than any other, much less privileged. Directional differences are purely a matter of our humanly oriented experiential-relational space.

Correlated with these spatial conceptions, developed over hundreds of years and displacing earlier Greek-based theories of relative, heterogeneous, and anisotropic space, there are epistemological assumptions of positive science. In brief, these include the following: (a) It is held that the world consists of at least space, physical materials, and forces of relation and change among the elements of matter. (b) The human mind (and parallel linguistic and symbolic systems) has the capacity to re-present objective states of affairs in our thought processes and symbolic representations. Thus, (c) what is true is what is a correct representation. Correct conceptual representations are held to work best (or perhaps only) in tight logically univocal concepts and in mathematics. In our area of concern – the visualization of data sets – the good/true map is one with features that correctly (completely and consistently) correspond to and re-present the topographical state-of-affairs. Similarly, data sets (e.g., the location of power and utility lines, land valuation and tax figures, zoning information, etc.) are true when they correspond correctly to the physical or social phenomena they represent and also fit correctly to the map itself. GIS then consists of a 'nested' series of representations that have their value in being correct and manipulatable re-presentations of objective states of affairs.

But, reality is not so simple. Certainly this is not the place to 'refute' or 'amend' the above assumptions. Here I can only assert that they are 'correct,' but incomplete and historically-politically constituted; that is, not straightforwardly anything like the whole and entire truth. This alternative position seems well established by current theoretical debates in the history of science, hermeneutics, and critical theory, to which we can refer should we wish (see Lefebvre 1991, Mugerauer

1991, D'Amico 1989, Gadamer 1989, McIntyre 1988, Heelan 1983, and Heidegger 1977). Suffice it to say that 'facts' or 'data' are not self-selective or self-validating; what becomes a fact or data-point or counts as 'information' does so only within the context of a conceptual-practical system, which itself has a historical, cultural context of limitations and aspirations, insights and blindness, fears and hopes. In short, *what counts as information or even as a geographic feature is a conceptual-pragmatic representation that results from discernment, selection, and suppression among alternatives within a historical, cultural world system.*

In addition, the lifeworld experience of places is primary and the conceptual constitution and grasp of abstract space a secondary and derivative development. As case studies in phenomenology, ethnology, and psychology demonstrate, in our experience, places appear as heterogeneous (not homogeneous), as a function of relationships to other people, places, and things (that is, relative, not absolute), and with directional differences of up and down, back and front, right and left, all of which are physiologically, psychologically, and symbolically charged (not isotropic).[4] Thus, our lived geographical experiences display features exactly the opposite of those attributed to space by the reigning conceptions of GIS. Since the similarities and differences of places experienced among individuals, groups, and entire cultures are among the chief sources of social cooperation and conflict, and of the opportunities and obstacles that we seek to consider, it is not politically sufficient or proper to operate from the limited conceptions of dominant positive science.

19.4 Alternative Geographies

That there are alternative geographies and alternative ways of visualizing spaces and places is patently obvious. One wonderful advantage of GIS is that it presents its diverse data *visually*. This is positive because, at some levels at least, those who are not fluent with concepts or numbers can interact with visual information – though social conventions are an enormous factor in sharing or mediating between 'creators' and 'users.' Further, cultural history shows that while some instruments are highly directive or limiting to those who use and interpret them, there are minimal limitations with simple drawing instruments (sticks scratching maps in the sand or dirt; drawing on hide, bark, paper, and stone with pencils or powdered-colored pigments; weaving various materials, or in the oral versions of mapping that specify places and routes with song and story. As to the latter, Bruce Chatwin (1987) nicely presents the Australian aboriginal tradition in which a physical-spiritual world is mapped by stories and songs; Inuit and other native American

[4] Within the large body of work in phenomenology and Gestalt psychology, of special note is the work of Rudolf Arnheim (1986), Thomas Thiis-Evensen (1984), and Maurice Merleau-Ponty (1979).

traditions of oral and visual mapping are covered in Bravo (1996), Rundstrom (1995), Moodie (1994), Brody (1988, 1989), Turnbull (1989), Aberley and Lewis (1998), Woodward and Lewis (1998), Walhus (1977), and Hisatake (1986).

Even a brief look at a variety of mappings makes clear that a range of compelling lifeworld geographies, rich in understanding, interpretations, and information, is brought forth by the designs and sayings/namings of many peoples where the visual and verbal systems are articulated in local or dialectical 'mother tongues' (which certainly are not the same as the systems of the univocal concepts in Western sciences, philosophy, and other discursive formations). The variation in mapping becomes obvious even in the simple set of figures provided in Figures 19.1–19.5.

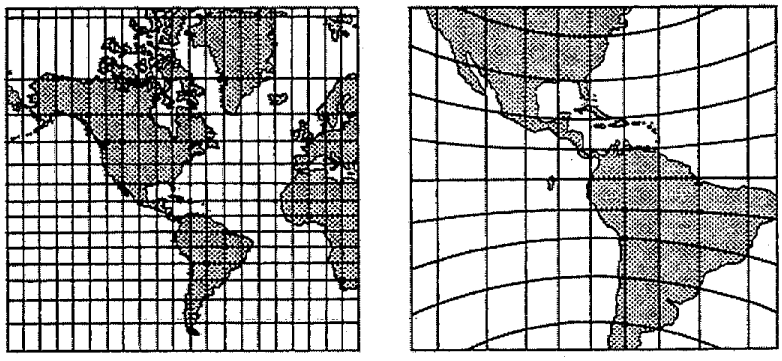

Figure 19.1. Standard Western cartographic representations: Mercator and Gnomic projections

Given the assumptions noted above that ground and drive GIS, it is clear how the now-standardized forms of scientific cartography provide the exemplars: they are taken to be the correct representations of the objective state of affairs. From this point of view, the other modes of mapping are interesting, perhaps, but 'incorrect,' or 'deviant,' or representative of some other dimension (such as the makers' dreams, feelings, impressions, limited perceptions, etc.), but not of the objective state of the world.

The assumptions discussed here and the attitude toward the 'incorrect' is nicely put by Peter Gould and Rodney White (1980).[5] Though they certainly are decent and well-intended persons, as are the rest of my positivistic colleagues, they ultimately display, use, and promote the austere judgments of positive science. When they examine 'the correlation between preferences and accuracy of location' they

[5] These authors, pioneers in perception and mental mapping research, are sensitive that class and economic resources make differences and they do describe the sociological understanding that comes from taking groups' perceptions as they are. Of course, their book is innocent of the theoretical sophistications developed here.

straightforwardly assume that the objective character of the terrain and correctness of representation are what matter.

> For our first, and to geographers, discouraging, plunge into spatial ignorance, we shall examine the situation in North Dakota. University students were asked to record the names of states on an outline map, and by recording the proportion of errors we can draw contour lines enclosing areas of equal misidentification. (Gould and White 1980, 82-83)

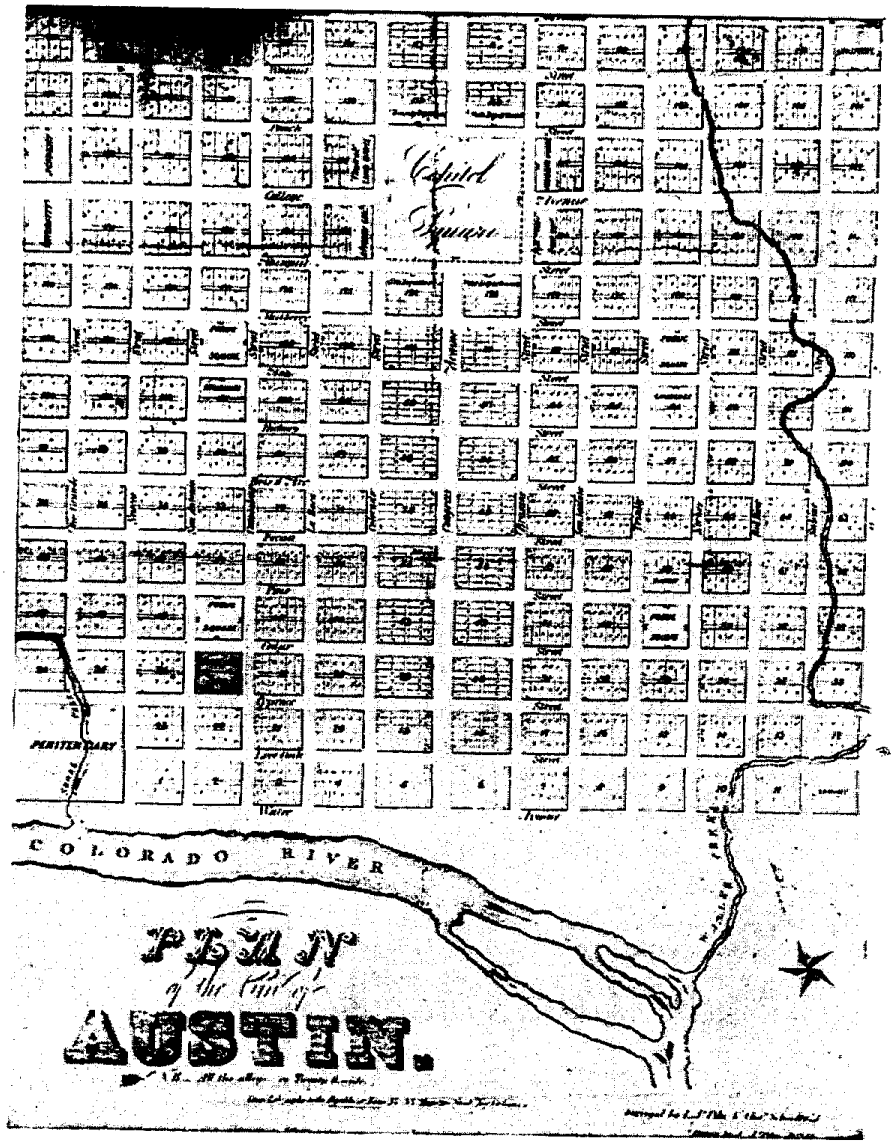

Figure 19.2. A standard city plan: Austin, Texas

Since they are scientific, they attempt to explain the cause of distortions and 'barriers to information flow' in terms commonly used in GIS and other information-communication studies and policies. They work to show that the number of transmissions (directly related to the number of people) and the degree of familiarity (directly related to proximity to geographical features described) explain the degree of accuracy or distortion of representations.

> After we have taken the logarithms of information, population, and distance from [our research area], we can write: log information = -1.38 + 0.87 log population - 0.40 log distance. . . . There is a very strong and significant relationship of information to both these predictive variables. (1980, 93)

The quiet force behind what Gould and White say lies in its comprehensive grasp of our increasingly global economic, legal, political, military, intellectual, and other institutions. Being able to present one's case in logical, linear terms, with quantitative evidence, is essential if one is to obtain a grant, be hired or promoted in the realms of research and technology, or convince a jury, city council, or government agency to grant one's request. This is why, no matter what one's epistemological or political position, *it is critical for those inside and outside the dominant realm to learn standard GIS.* Since the standard view is what exercises power in the world today, and increasingly so, one has to be able to understand it and participate in it or become excluded from power of all sorts. To argue against the importance of the reigning view concerning objectively arranged space and its technologies, including GIS, would be pointless. Thus, a first conclusion: those who have no access to GIS need to find a way to learn it, to acquire access to it, to use it. But, this is a minimal consequence of our reflections, for it is pragmatically harmful if one's lack of technology leads to being eliminated from the world, either effectively or actually.

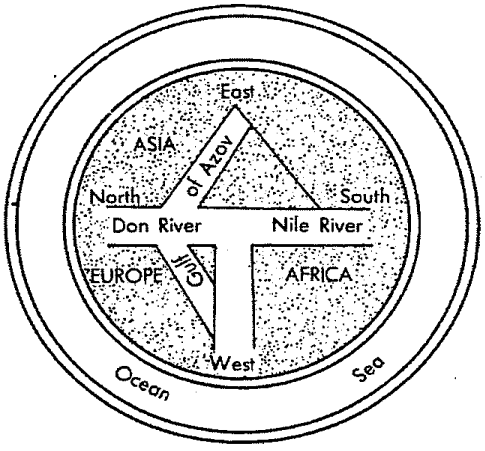

Figure 19.3. A medieval European T-O map

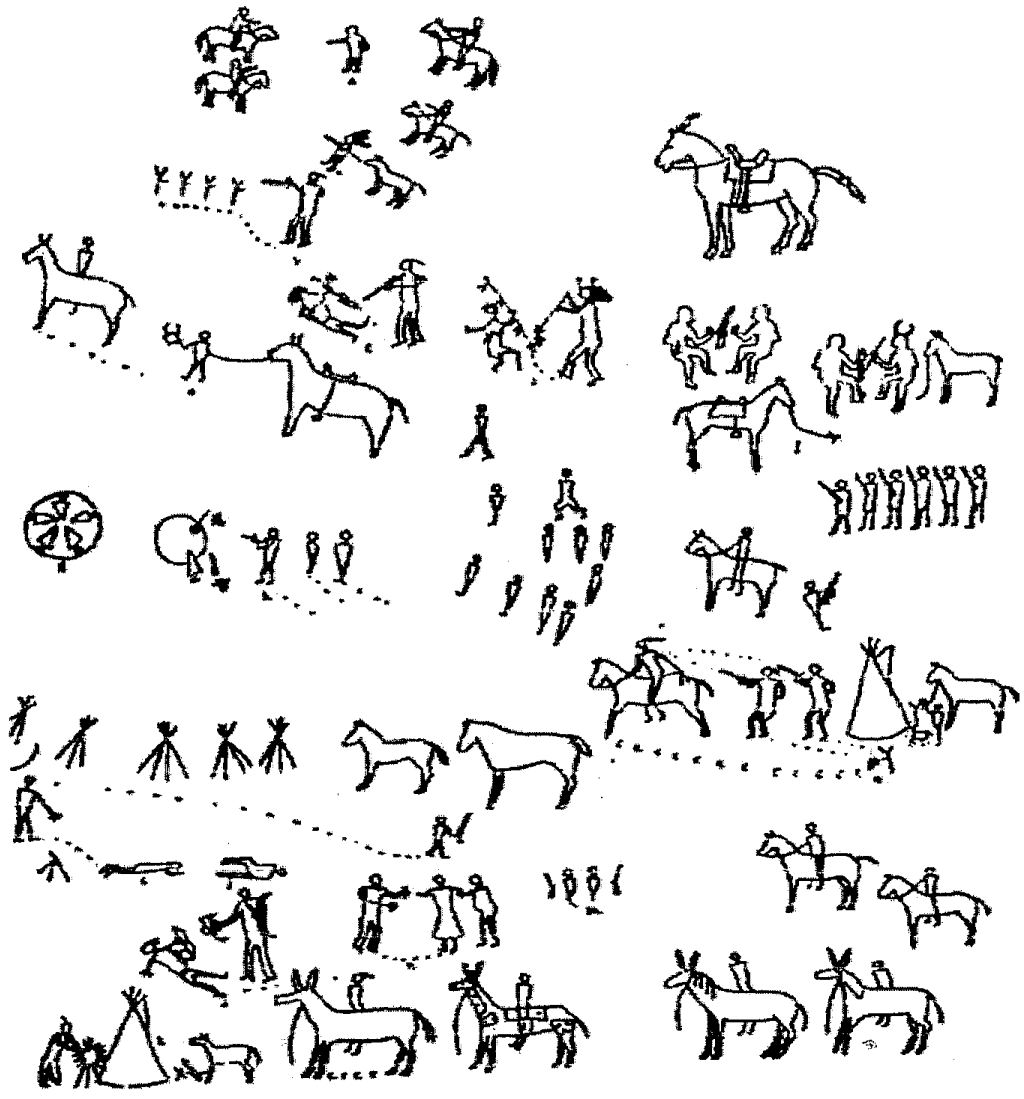

Figure 19.4. A Blackfoot tipi cover, painted with war episodes

Figure 19.5. A map from Paulo Freire's pedagogical exercises. Reprinted by permission of Continuum International Publishing Group from *Education for Critical Consciousness*. Copyright 1973 by Paulo Freire.

19.5 Obvious Issues

The problems with current GIS systems and their social uses form a relatively simple cluster, no matter what one's personal political or intellectual position. Since the dominant technological systems are grounded upon the post-renaissance, post-enlightenment system of rational-mathematical science, understanding the world depends, as Galileo already noted, on ability to do mathematics. Today, alternate symbolic systems are becoming available in forms we call 'user friendly' but which actually amount to translation of mathematical-logical codes into other representational forms, typically iconographic. Thus, while the 'driver' does not need to write code or understand the workings 'under the hood' she does need to have 'dashboard knowledge.' That is, the user must be literate in and dexterous at symbol distinctions, sequencing and other analytic-logical relations and operations, as well as in certain kinds of behavior routines.

Even setting aside the enormous pedagogical and political problems of how to help others become computer and GIS literate, there remain several bitter realities facing policy decisions. Given that there are many people who do not have access to the dominant GIS technologies and worldviews, there is not agreement on what to make of this fact. Currently, those with the information technologies live in a world where those without it largely are *ignored.* Apparently, many GIS specialists are or should be concerned with finding solutions to these problems. Most of us apparently believe in the value of inclusion of disenfranchised groups and in cooperation with other world systems. But, we need to be critically aware of our diverse motives and assumptions, lest we ourselves act imperialistically. Not surprisingly, even the well-meaning formal directives behind the NCGIA Varenius Project seem to consider the needs and possible remedies in terms of 'concepts' that 'reconceptualize, measure, represent, monitor, and plan for the new emergent geographies'[6], thus almost inevitably casting the project in the very terms of the dominant 'imperialistic' educational process. This is perverse since *it is precisely by their differences from the standard and dominant categories that the already marginalized groups constitute their identity.* In addition – though unavoidably – these 'have-nots' (the learners) are required to consciously or unconsciously conform by internalizing and using the very 'normative' concepts, maps, and images of the dominating groups (the teachers, fund-providers, and ultimately the 'host' social-conceptual-technological systems or cultures), of which more shortly. In its current form, it would appear that well-intended projects such as Varenius are reconceptualizing the issue in the same rationalistic terms that will perpetuate the inequality of accessibility opportunities, insofar as the latter have any substantial economic or political force, or further obliterate local, differentiated groups' identities.

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[6] Cited from the NCGIA Varenius Project's 'Call For Participation'in 1998.

Further, we would need to be self-critical about our participation in the thoughtless confidence we likely have in the powers of communication and education. Communicating information, in itself, may release pent-up psychological or social pressures, but does not constitute or substitute for rationalized collective action (Blackburn 1989, Mazzioti 1984). Then, there is the undeniable fact that since knowledge and technology are forms of power, many factions in the world would prefer to *exclude* groups (so they remain powerless and unthreatening, or so that they constitute a larger unskilled group for the mining of relevant ores and elements or for the cleaning of toxic by-products of the industrial processes of high-technology).

In addition, there are two further dangers so serious, I believe, as to merit special attention. One is a version of the just-discussed *exclusion.* We have to deal with the fact that a great deal of the current interest in spreading access to information technologies stems from desires to exploit those without (or those who fund the fundless 'consumers-to-be'). The reasons are many: selling hardware and software and services to under-participating groups results in enormous profits and expanding professional job opportunities, banking of political good will, or power via image enhancement. Without denying the good that has come about within or from traditionally disenfranchised groups, we can not ignore the evidence that too much is solicited and sold largely for the sake of profit; too much is 'done unto others' by technical experts (even if well meaning or 'harmless and politically neutral'). What is the actual, positive accomplishment, in terms that matter to them, of GIS becoming available to the disadvantaged poor, homeless, veterans, migrant farm workers, and others? Does it allow them to do something they genuinely need or want, to become personally transformed to embody their own potential rather than the 'plans' of someone else? There is evidence that the Emperor of GIS often has no clothes (Forsher 1998).

We need more research and better policies concerning those on whose behalf we speak – a problem in itself--insofar as they are deemed important in our culture only, or largely, because they constitute the next market group to be exploited as consumers, whether they benefit from the newly installed equipment or not. *We need a fuller understanding and appropriate measures of what would matter* ***in their own terms and value systems*** *to those without technology, to those with different worldviews and geographies.*

Second, no matter that some of those in power seek cooperation and inclusion while others exploit and exclude, we cannot assume that the 'others' are indifferent or passive in these charged global issues. On the contrary, in addition to being pressed by those who 'want in', our dominant political-intellectual-cultural worldview or system already is under attack by groups who not only do not share our worldview, but who do not want to. They who actively want to defeat its spread across the world or even roll back its current influence. There is every reason to believe that the attacks will continue.

At the same time, it is reasonable to believe that confrontation is not necessary in every case. Sometimes conflict is preventable among people of good will, and we can better learn to interact positively with others. *It is an essential part of special-*

ist groups' deliberations and consequent actions to figure out how to cooperate with those who would affirm their own distinctive worldviews and geographical information systems; that is, with those who do not want to lose their own identities and ways of life just because they might have the opportunity to obtain access to ours.

19.6 Toward a Solution: Pluralistic-Democratic GIS for Mediating Individuals and Groups

The proposed partial solution to many of the problems outlined above aims at an affirmation of the identities and differences among individuals and groups within the context of a shared set of worlds. This would be the contemporary, information-age version of *e pluribus Unum*. Without the 'one,' we have chaos – anarchy, if not war; without the 'many,' we have totalitarianism.

The outcome envisioned here is intended to be simple and realistic. It is simple in that, opposite to a monoculture, which seems to spell doom to human social groups just as surely as to soil and crops, it envisions living in a multiply-cultured, non-isolated, set of worlds while maintaining several, possibly changing, identities. The vision is realistic in that it has operated across time and space for thousands of years. Very few people actually have been or have remained members of absolutely undifferentiated monocultures. Even within small primal groups there are multiple sub-cultures: men's and women's groups, earth and sky groups, monkey and snake people, children and post-initiates, gatherers, warriors, and shamans in dynamic relationships. Even among the earliest and most closed groups there are those who operate at the borders, learning and using the languages and material items of neighbors. The ancient trade of colored stones and weapons worked because groups with strong focal identities nonetheless had ways to interact with others who, in effect, lived in different worlds. The same phenomenon continues with the millions of migrants in today's world. Think of the worldwide phenomenon of children of immigrants mediating between the 'old world' culture of the transplanted grandparents and the host culture of the streets.

Transculturation does work. How? Note, here I am not talking about replacing one culture with another; whether freely chosen or forced. That phenomenon has to do with the operations of monoculturation. I mean the process whereby one maintains one's own initial cultural world and comes to participate in another, or several others, which also become one's own, while remaining able to pass back to inhabit, even to deepen, one's original 'home.' Again, most of us do this regularly, as would be apparent if we discussed our own lives as sons and daughters and parents, as Irish-American researchers studying Chilean economics, as academics who also repair and race motorcycles, and so on.

The process of which we are speaking is one of mediation, where some people open to each other, help each other to cross over and back, between cultures. This

mediation is a *trans-lation*, which literally means a going over, across; a bridging. The persons with technical GIS expertise obviously have to be translators: they have to hear and understand what is being said to them about a world they do not genuinely inhabit and then try to help translate that into some kind of GIS presentation. But, first and foremost, those who articulate their own world do the translating, because they have to bring out of themselves the 'design' of their world and then name and reflect on the subtle, normally assumed and unspoken relationships among its elements. They have to go over across to the foreign, unavoidably falsifying, and dangerous formats of GIS, and then try to come back again, to their own worlds.

In addition to the question of whether and how GIS systems might be – or become – adequate to such a bridging, there is the more fundamental question of whether and how the different sets of people involved would be able to undertake and succeed at such a task. There is some reason to be hopeful if we consider the already developed and partially implemented theory and practices in planning and communication that are known as 'pluralism and advocacy' and 'critical theory,' which may be updated and newly implemented via GIS. As Davidoff and Reiner successfully argued, those with expertise must help those in need to articulate their own goals and visions, to translate and evaluate these into their own terms and into the coin of the current regime, and then to make their own decisions and, with the help of the expert, present their cases in terms of the group in power (Davidoff, 1965; Davidoff and Reiner, 1962). This does, I believe, need to be made less politically optimistic (or naive) by moving it in the direction of critical theory. As Habermas (1984, 1987), Forester (1980, 1982), Albrecht and Lim (1986), and others point out, the legitimacy of institutions as well as educational and political projects depend on the satisfaction of more complex criteria. There has been considerable work to show that there are at least four necessary and sufficient conditions to be met before an action can be considered legitimate: clarity, veracity, trust, and consent or validation by the groups affected.

How can we somehow deal nonarbitrarily with others in a way that results in genuine common understanding and a shared world, and that does not destroy actual and fruitful differences in the name of the unbearable sameness of forced monoculture? How can we be self-disciplined so as to respect others and thus ultimately enjoy their differences in our lives? How can we learn the non-intrusiveness and non-imposition that are crucial to understanding and practice?

Boundaries need to be acknowledged and respected. By letting the boundaries be, we mark differences, but are not separated by them. In pursuing personally important issues, we become able to pass over to other's concerns. We also necessarily pass back again, because (despite the claims of objectivist methodologies) we can not 'become' the other. By passing back again, we affirm our own and the other's identity.

Brazilian Educator Paulo Freire, through his life's work and his famous books, such as *Education for Critical Consciousness* (1968) and *Pedagogy of the Oppressed* (1973), argues that all of us, including educators, face the constant and grave danger of being tyrannical and imperial (cf., Putnam 1978, Collins 1977,

Lankshear, Paters, and Knobel 1996). To teach the corpus of knowledge and procedure that is the heart of any tradition, we need to teach students by way of standard, proven concepts, and methods. The very power and applicability of these concepts and methods ensures that they can be understood by everyone and passed on. Thus, in the rational, scientific world, Newton's concept of mass, Marx's concept of contradiction, or Rawles' concept of justice are univocal and precise. But, as noted above, this means that to educate our students we impose these concepts and practices upon them, consequently also forcing their experiences and actions, that is their worlds, into preexisting, standard concepts, which, after all, are not politically innocent.

The same is true of all learners' problems. The learner wants to know how to use GIS. To proceed with our expertise, which presumably is why we are valuable and have been brought onto the scene, we translate the learner's vague needs and general wants into precise terms. We supply or develop, and then apply, instruments that will give exact and irrefutable results and indications for practical procedures. We develop lesson plans that will be maximally functional, that fit with the correlate needs of the group and within the prescribed social-economic, aesthetic norms.

In these cases we exercise our power and accomplish things in the world precisely insofar as we get the learners to participate in and, thus, continue the preexisting and dominant system. To some extent this is good and unavoidable: learners want and need to learn GIS to become part of the powerful, dominating world. But, at the same time the result is oppressive to them and ensnares them in a cycle that continues the processes of oppression (with them now appropriated to continue what they have internalized). We know that we *also* need ways to *respond* to the worlds of individuals and groups so that what we come to understand and do together is generated out of the existential reality of these life-worlds. We are responsible for not stamping out their specific ways of being in the name of profitable and expedient homogeneity. We are responsible for developing ways to see, attune ourselves to, and nurture the life-worlds of others, including those who place themselves or are placed in the trajectory of our influence.

Freire agues that the primary way to do this is by disciplining ourselves so that we can listen to what others have to say and by *changing our professional mission to helping others to say what they want to say in their own terms*. In Freire's view, this means starting with the admission that we do not know what the other person's world is like, nor what their real problems and needs are, much less what acceptable solutions would be. Nor, likely, does the other person. If they did, they would not need or consult us. The vibrant relation between learner and teacher is generated insofar as teachers can help learners to name and become conscious of their worlds, their needs and possibilities. The process of helping learners to articulate their worlds in their own terms is a process of liberation and empowerment, for them and for the experts too.

Freire's approach integrates educational, political, and social theory with personal experience. He contends that the freeing transformation of *praxis* is achieved through dialogue in a process (in his words, *conscientizacao* – conscientization)

that allows us to critically assess and understand society and our situation in it. The process begins with investigations that uncover what Freire calls *generative themes*, that is, the controlling postulates that are existentially and emotionally powerful to a group. These themes are then presented back to the group through a series of often-pictorial *codifications* in which the teacher elicits distinctions such as those between cultural and natural dimensions or relationships among inside and outside groups contending for power.

In this format, where problems are raised for people to discuss in their own terms, contradictions naturally are discovered; in turn, these can be codified and presented for further reflection. Thus, the educator can pose a problem to the group; through dialogue the group begins to surmount the initial limitations of the situation. Obviously, the only way for the project to work successfully is for the participants to engage in genuine dialogue together, for intensive and long periods of time. Together, and scrupulously avoiding thoughtlessly accepted concepts, what matters has to be allowed to be named and thought in its own terms, that is, in terms of the character of each thing and the webs of relationships among them. In the process, the learners can discover for themselves the contradictions among elements and systems of meaning, intent, and practice. They can begin to explore how the contradictions might be overcome in ways that allow the maximum nurture of their world as it discloses itself to them.

To have a more concrete sense of what this means, think of the fieldwork involved in understanding a given geographical realm. We know that it is easy to do research in the relevant literature, draw out the necessary concepts, devise a hypothesis, and formulate a questionnaire. After a pilot project or two, we are ready to go, to translate the not-yet-known into the known. But we also all know how we falsify the worlds we are studying when we do so--at least by leaving out so much, and I would agree with Freire, by violently translating everything into foreign, standard categories. To remedy this, it is increasingly common to try to go open-mindedly and see what is there. Then, from initial field observations and conversations, we devise open-ended interviews, and if that information is not precise enough, formulate questionnaires. But, these procedures have to do with *us coming to know their world. Freire's point is that the opposite needs to happen: the others need to articulate-delineate their own world, in their own terms.* Thus, though we can assist in the process with our expertise and technologies, our first obligation is to facilitate visualization and dialogue among the participants, who thereby articulate their world for themselves and us, as they explain it to us.

Comparative theologian John S. Dunne develops a very useful strategy that may help us to 'pass over' from ourselves to others, and then to pass back (1967). Dunne begins his reflections with a personal search for what some take to be the issues that matter most. 'How can I deal with my fear of my death?' 'Is there a God?' 'Am I all alone in facing life's difficulties?' These timeless questions have been encountered by many over the past centuries, but still are mine right now, to be answered by me, unavoidably. Though each of us has to answer such questions for ourselves, since others have asked these questions before us (and perhaps even found 'answers' or at least comforting resting places along the way), Dunne explores our issue of personal and shared understanding.

He argues that in pursuing personally important issues, we become able to pass over to other people's concerns. We necessarily also pass back again, because we cannot ever become the other. By passing back to our lives again, we affirm both our own and the other's identity. By passing over and back, based on shared struggles with the same genuine questions and realities (such as death and loneliness), our personal questions

> . . . can be broadened and followed in a much wider context than they ordinarily would be. The passing over and back, then, tends to bridge the gap between private knowledge and public knowledge and to give the seeking and finding that occurs on a strictly individual level something of the communicability of public knowledge. [Comparing one's personal questions and findings with those of others allows us to be] . . . able to pass from the standpoint of our lives to those of others, to enter into a sympathetic understanding of them, to find resonances between their lives and our own, and to come back once again, enriched, to our own standpoint. (Dunne 1967, viii-ix)

That such a process is reasonable theoretically and practically could be further established if we had the opportunity by referring to the non-ideological work of other diverse figures, such as Gadamer (1989), McIntyre (1988), and Heidegger (1966). Gadamer, for example, demonstrates how fusion of differing cultural-temporal horizons may happen when we encounter a 'text' with a genuine question. Our pressing concern may evoke new meanings, perhaps unintended by the original author, from the work which we address seeking insight. Heidegger and McIntyre account for parallel phenomena of mediation as *trans-lation.*

19.7 GIS Applications for Empowerment

GIS admirably suits itself to such a process. It can provide the means to graphically present the mapping of one's own world in most whatever way one wishes. (Remember that built into the very code systems and protocols there are deeper, fixed limitations that ultimately need to be overcome or removed.) What matters in a mapping, what is included and excluded (such as the relations among elements, the means and forms of graphic presentations) would be worked out in each original application of a system to a newly delineated and articulated world.

Importantly, the decisions that stem openly and responsibly from implicit and explicit value systems can be respected and built-in from the start. What was not self-consciously used can come to group consciousness so that its future importance may be decided. And, since learners would have to visualize-articulate their own world in their own way and then format that into GIS, they would start with their own world, pass over into the dominant one, and then back into their own (now bi-cultural realm). The teacher would begin in the dominant technological world of GIS (at least for purposes of the technical facilitation, but not necessar-

ily), pass over, at least a bit, in dialogue and work to the world of the learners, and then pass back into her own.

Theoretically and practically, we are justified in holding that 'there is no absolute standpoint, since no standpoint would exhaust the truth of human culture and built reality, though there is the possibility of our passing over from one contextual horizon to another' (Dunne 1967, 5). Parallel with this, there is no purely relative standpoint, since though humans operate within specific traditions, disciplines, and cultural contexts, one's deep questions, patterns of thought and action, and way of life do connect with those in other traditions, disciplines, cultures, and times.

Boundaries need to be acknowledged and respected. By letting boundaries be, we mark or even celebrate the differences, but are not isolated by them. Crossing boundaries, then, is *not* a matter of scientific method achieving objectified knowledge; *nor* is it idiosyncratic voyeurism. Crossing over and back is possible because we face not the problem of the unintelligibility of the other, but the *inexhaustible intelligibility* of other people, practices, processes, GIS, and other information technology projects yet to come.

In contrast to the positivistic mental mapping procedures of the dominant GIS paradigm (recall the quotation above from Gould and White), examples of self-articulation exist that can be amplified. On the one hand, there are the many grass roots electronic communities that could implement GIS in the same spirit in which they now do operate electronically. We all have our favorite community Web sites.[7] Groups of specialists and ordinary users alike need to collate and share sources so that we all can learn from the entire set whose productions we value.

In addition, to focus on the basic operation of mapping, it would be interesting and fruitful to transfer to GIS the grass-roots mapping processes underway around the world, such as documented in *Boundaries of Home: Mapping for Local Empowerment* by Doug Aberley *et al.* (1993). In contrast to the criteria of good = true = correct in positive science, Aberley contends that

> It is important to repeat over and over that there is no 'good' mapping or 'bad' mapping. Leave the need for perfection to the scientists; what you are being encouraged to do is honestly describe what you already know about where you live in a manner that adds momentum to positive forces of change. . . . every region has the potential to be represented by as many unique interpretations as it has citizens. Reinhabitants will not only learn to put maps on paper, maps will also be sung, chanted, stitched and woven, told in stories, and danced across fire-lit skies. (1993, 5)

A moderate and seemingly unproblematic application would involve using existing, standard, and GIS base mappings to which personalized, or local, or biore-

[7] Among my favourites are Austin Free-Net <http:// www.austinfree.net> and the Community and Civic Network Discussion list <COMMUNET@LIST.UVM.EDU> archived at <http://list.uvm.edu/arch/archives/ communet.html>.

gional information would be added.[8] This is related to my own work with Barbara Parmenter and an interdisciplinary team of graduate students to generate a Qualitative GIS for a neighborhood planning project outside Austin, Texas. The residents in the Spicewood Corridor, off the Old Spicewoods Springs Road west of the city, are seeking a way to explore their own identity and that of their local place in order to begin to imagine ways to develop and keep safe the qualitatively distinctive environment in which they have chosen to live. This is a still-emerging version of a conservative Qualitative GIS, in which we are encoding information about the experiences of the natural environment and personalized individual and group information onto the standardized GIS databases.[9]

A more difficult and yet promising project would be to use basic GIS formats to generate customized combinations of not-necessarily-representational 'designs' and 'words' to *originarily* let a worldview emerge and be named in its own terms. There is no reason at all why a combination of Freire's proven pedagogy that combines visual representation and naming-dialogue in local, dialectical words cannot be transformed into visualization that presents other quantitative information and qualitative interpretations in a democratic, pluralistic GIS system.

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[8] Doug Aberley, Beatrice Briggs, Kai Snyder, Jonathan Doig, and George Tukel supply examples of successful case studies and techniques.

[9] The Web site for this project is <http://mather.ar.utexas.edu/students/cadlab/spicewood/> (For information on the Spicewoods Springs Road Project: drbob@mail.utexas.edu).

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